

LED Replacement Lamp Trends

DOE SSL Market Introduction Workshop

Pittsburgh , PA

By

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Strategies Unlimited

July 18, 2012

About Strategies Unlimited

- Market **research** and consulting firm - founded in 1979
- Long history of market research
 - photovoltaics,
 - compound semiconductor materials and devices,
 - image sensors and lasers
- Have followed the LED market since 1994
- Reports on
 - overall HB LED market (annual),
 - LEDs in lighting (annual),
 - LED luminaire market,
 - LED driver ICs, and
 - LED replacement lamp market
 - LED outdoor lighting market
- Annual LED industry conference, *Strategies in Light*, since 2000
- Acquired by PennWell Corporation in 2001

LED Replacement Lamps

Some Definitions

Lighting Industry



- Lamps—Light source

- Technologies include Incandescent, Halogen, Compact fluorescence(CFL), Linear Fluorescent Tubes(LFT), High Intensity Discharge(HID) includes, Mercury Vapor(MV), Low Pressure Sodium (LPS), High Pressure Sodium(HPS), Metal Halide and Ceramic Metal Halide, Induction, and LED

- Fixtures-

- does not include the light source

- Ballasts

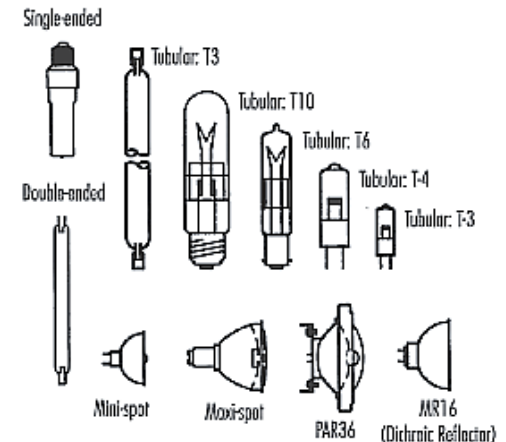
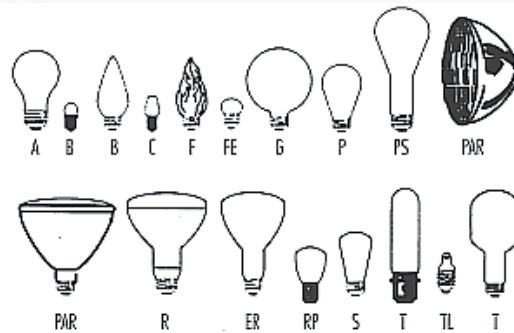
- Power Management

- Luminaires

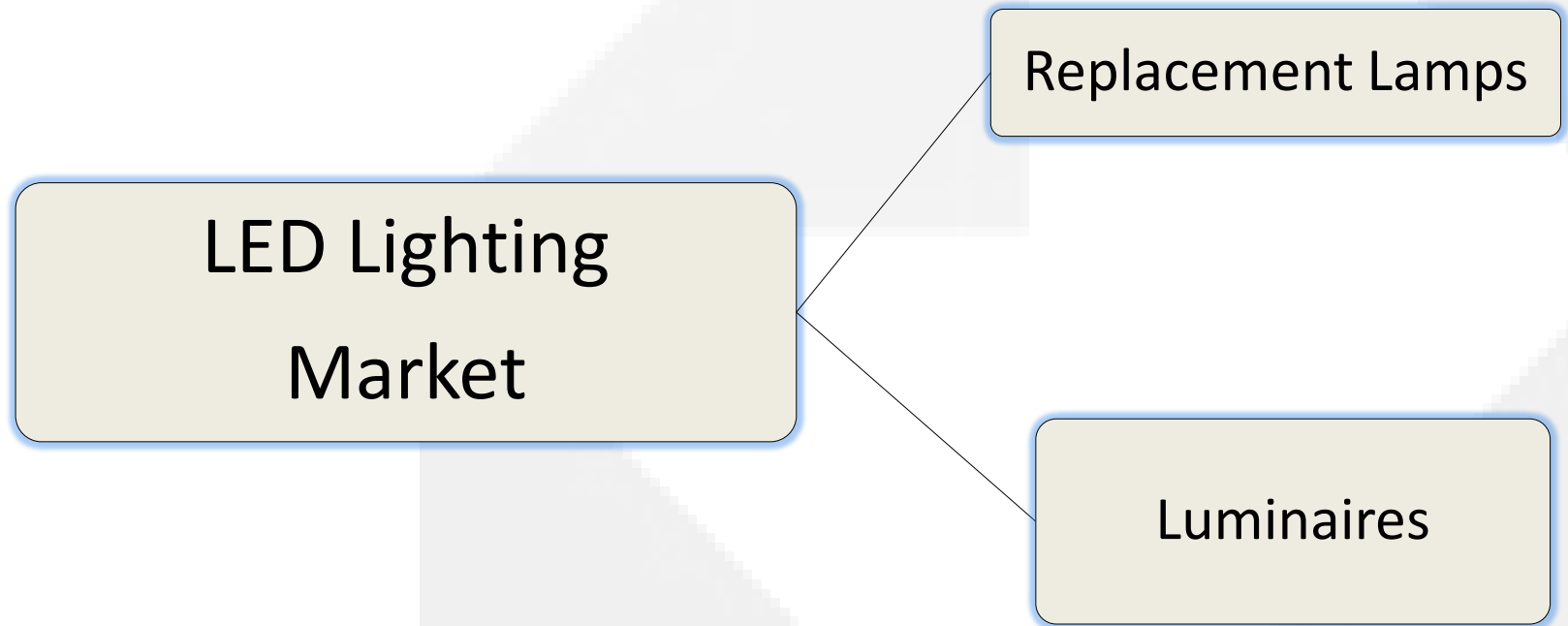
- Light Source + Fixture
 - New nomenclature for SSL
 - Convergence of light sources, ballasts and fixtures

- Controls

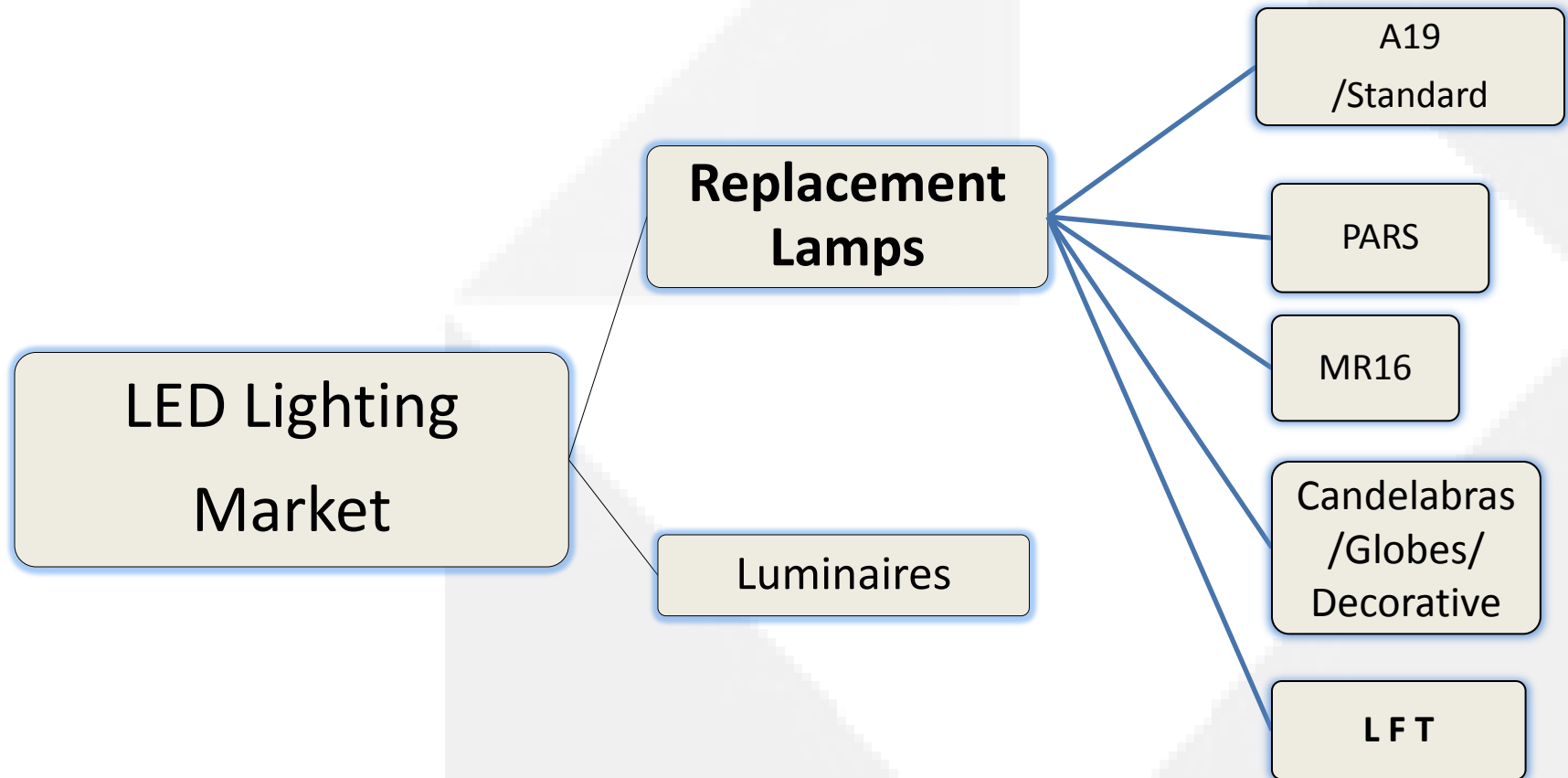
- Lighting system controls including Dimmers, Color dials, Mood Lighting, Wall plug controls, facility wide lighting controls, wi-fi, radio and internet controls



LED Lighting Market Segmentation



LED Lighting Market Segmentation



LED Replacement Lamp

A-19 Lamp



Source: Philips

PAR Lamp



Source: Sylvania

MR 16 Lamp



Source: Toshiba

Candelabra Light



Source :Industrial LED

LED Tube

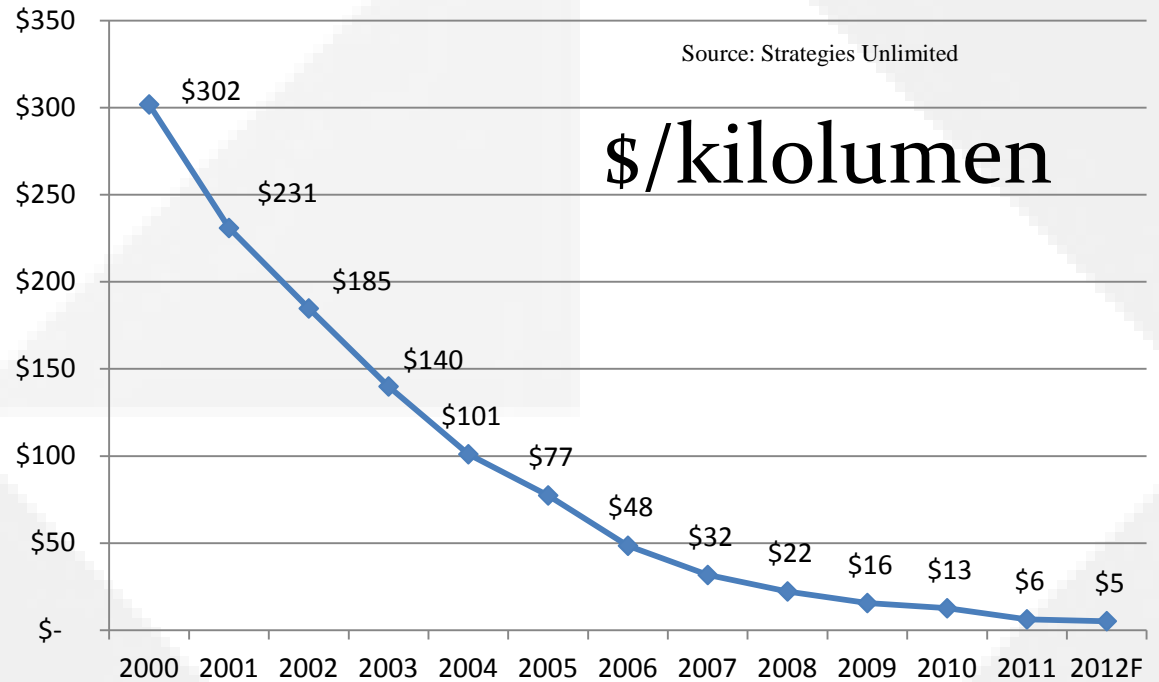


Source: Made-n-China

LED Replacement Lamps

Market Overview

LED Performance



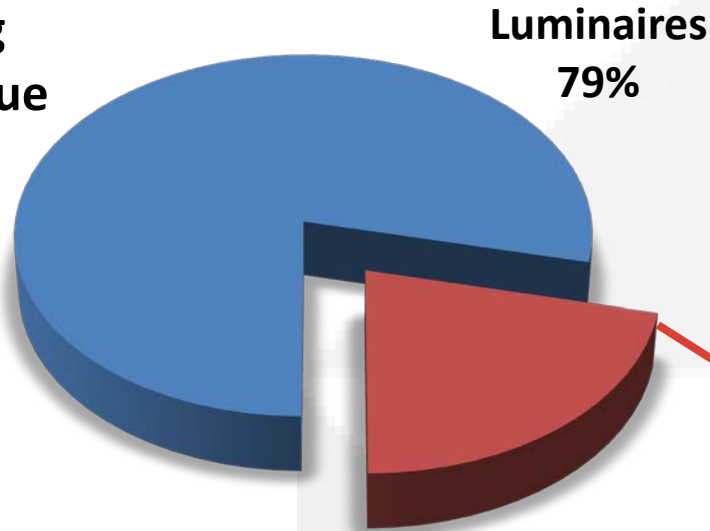
Price \$/kilolumen for 1W High-Power LED with CRI: > 75 2011

\$/ kilolumen for 2700 K per 1 W package	\$ 8.50
\$/kilolumen for 3000 K per 1 W package	\$ 7.50
\$/ kilolumen for 3000 K - 4000K per 1 W package	\$ 5.00
\$/ kilolumen for 4000 K and up per 1W package	\$ 4.50

Source: Strategies Unlimited

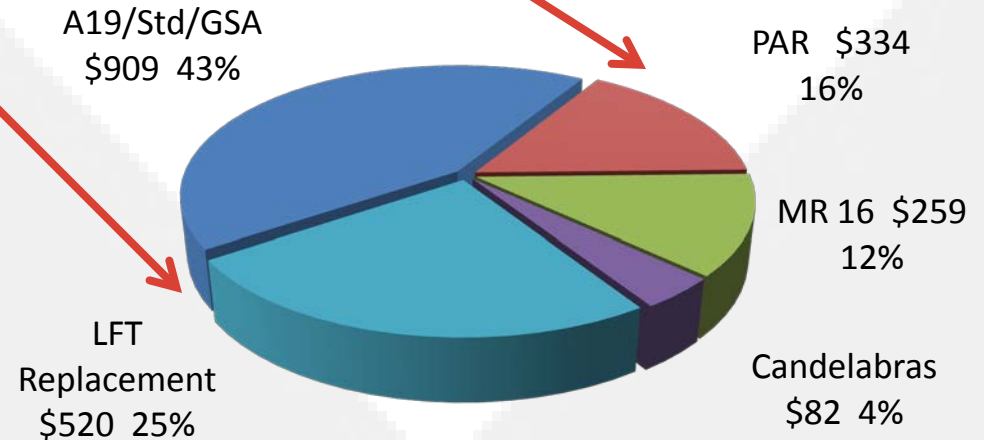
2011-LED Replacement Lamps

**LED Lighting
2011 Revenue
\$9.8 billion**

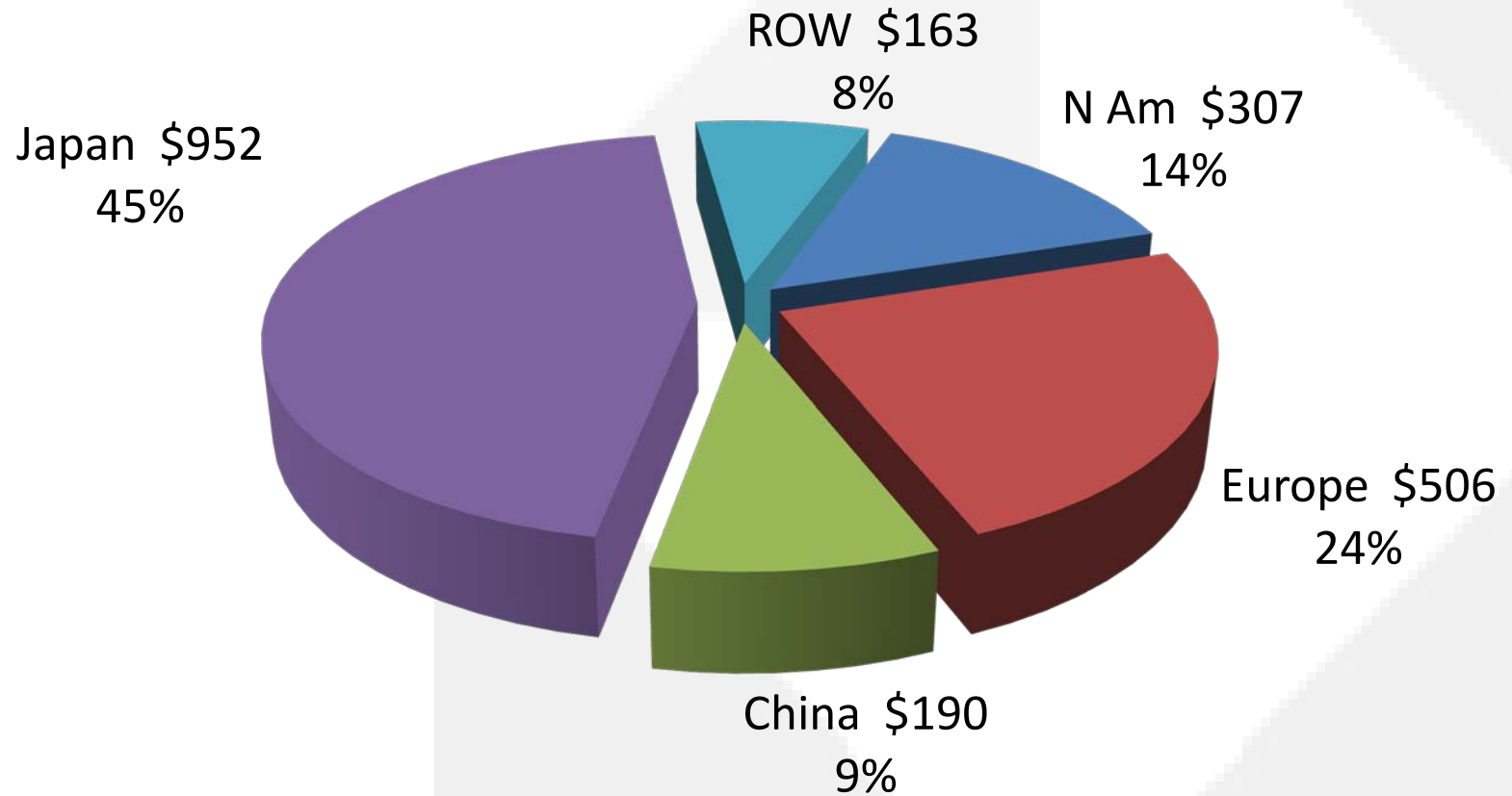


**Replacement
Lamps
21% -- \$2.1 Billion**

Source: Strategies Unlimited



Regional Distribution-2011

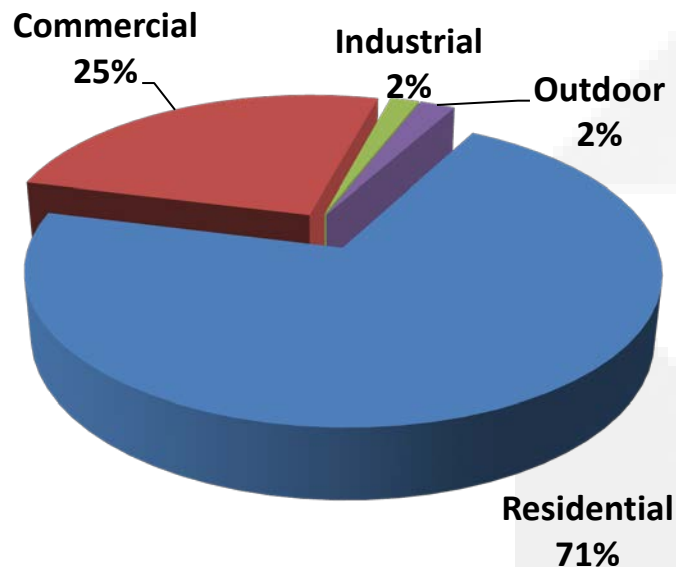


Replacement Lamps

US Market Characterization

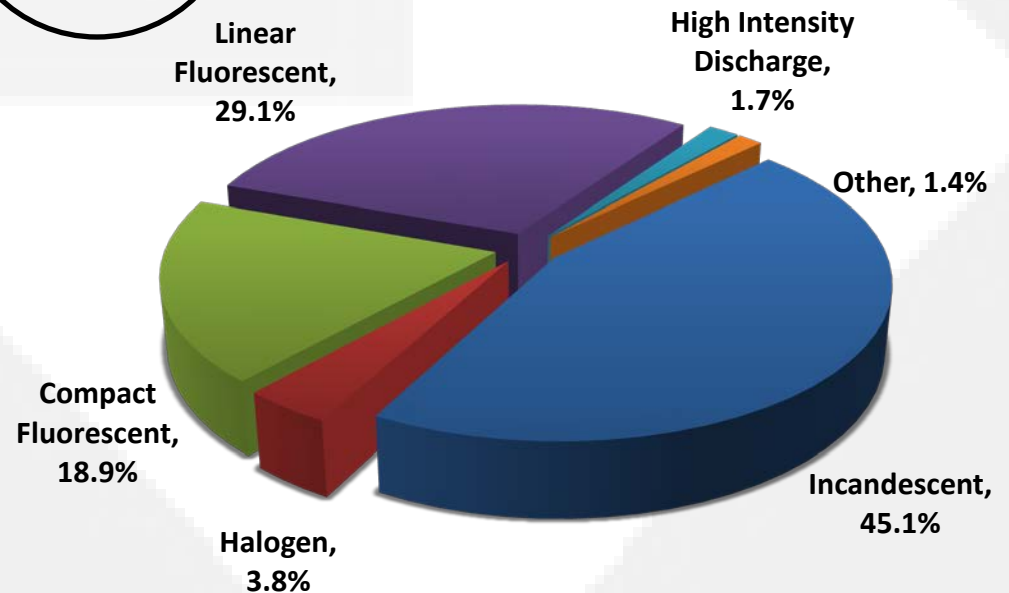
Estimated Inventory of Lamps in the U.S

By End-Use Sector



By Light Source Technology

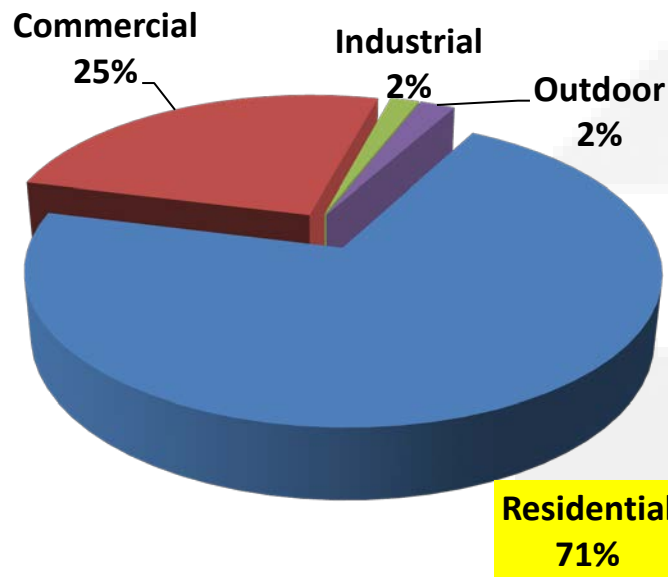
**Total: 8.2
Billion
Lamps**



Source: 2010 U.S. Lighting Market Characterization, DOE

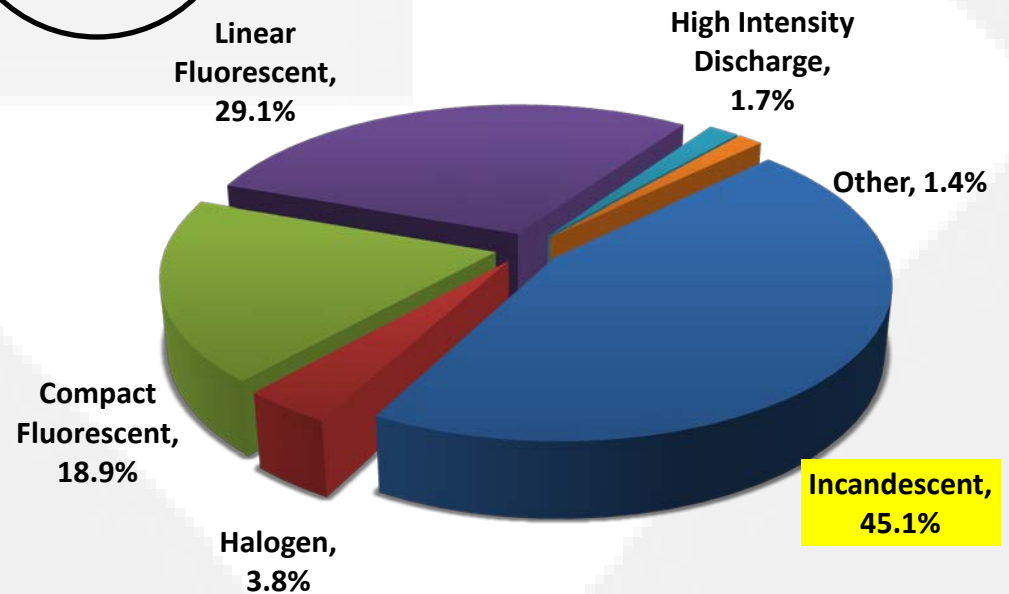
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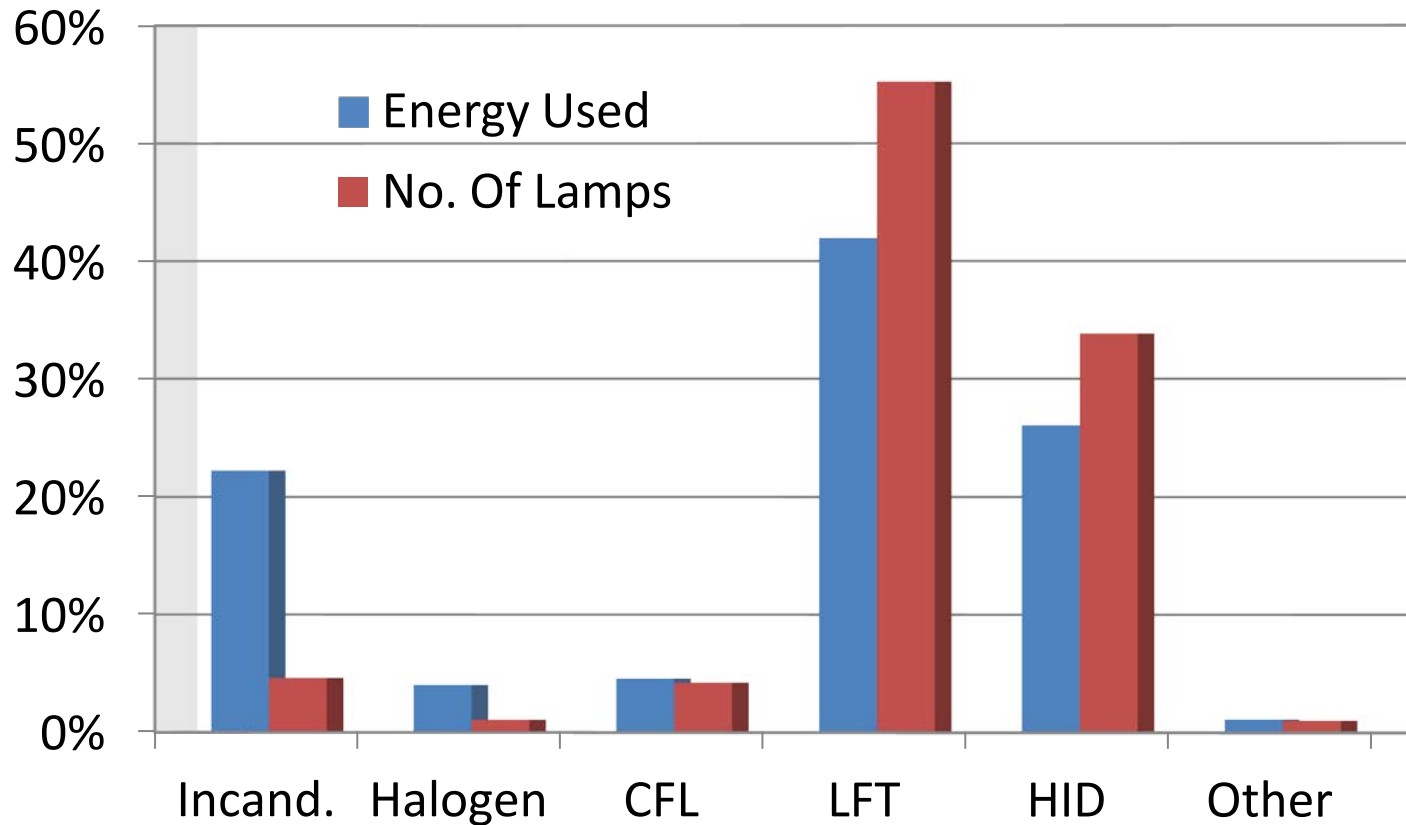
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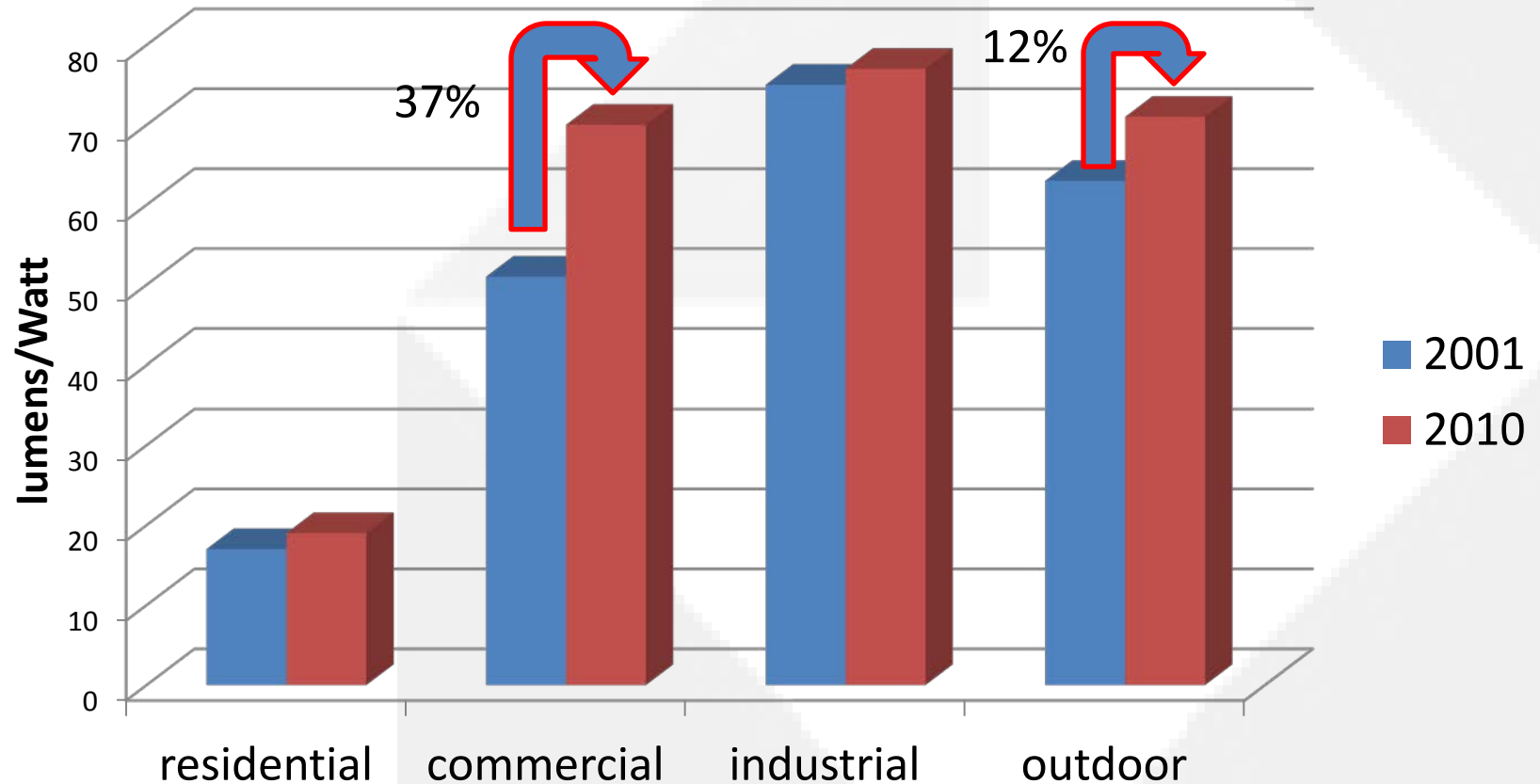
Source: 2010 U.S. Lighting Market Characterization, DOE

Energy Used by Lamp Type in US



Source: 2010 U.S. Lighting Market Characterization, DOE

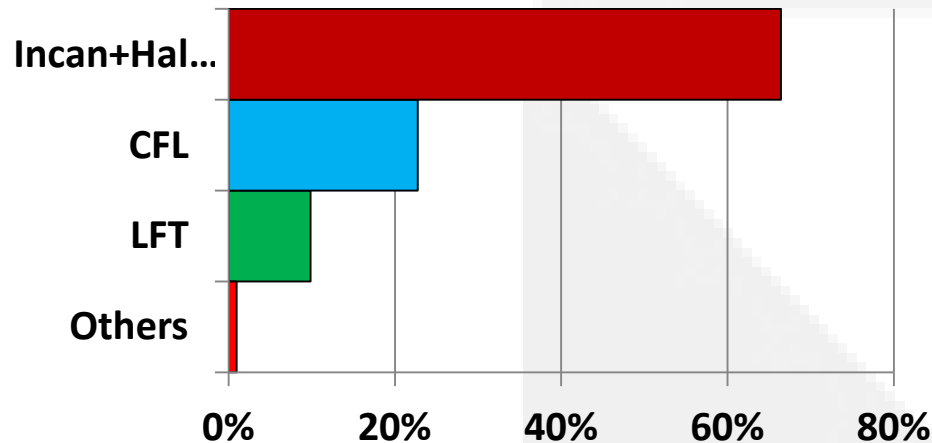
Average Lighting Efficacies in US



Source: 2010 U.S. Lighting Market Characterization, DOE

Residential Sockets

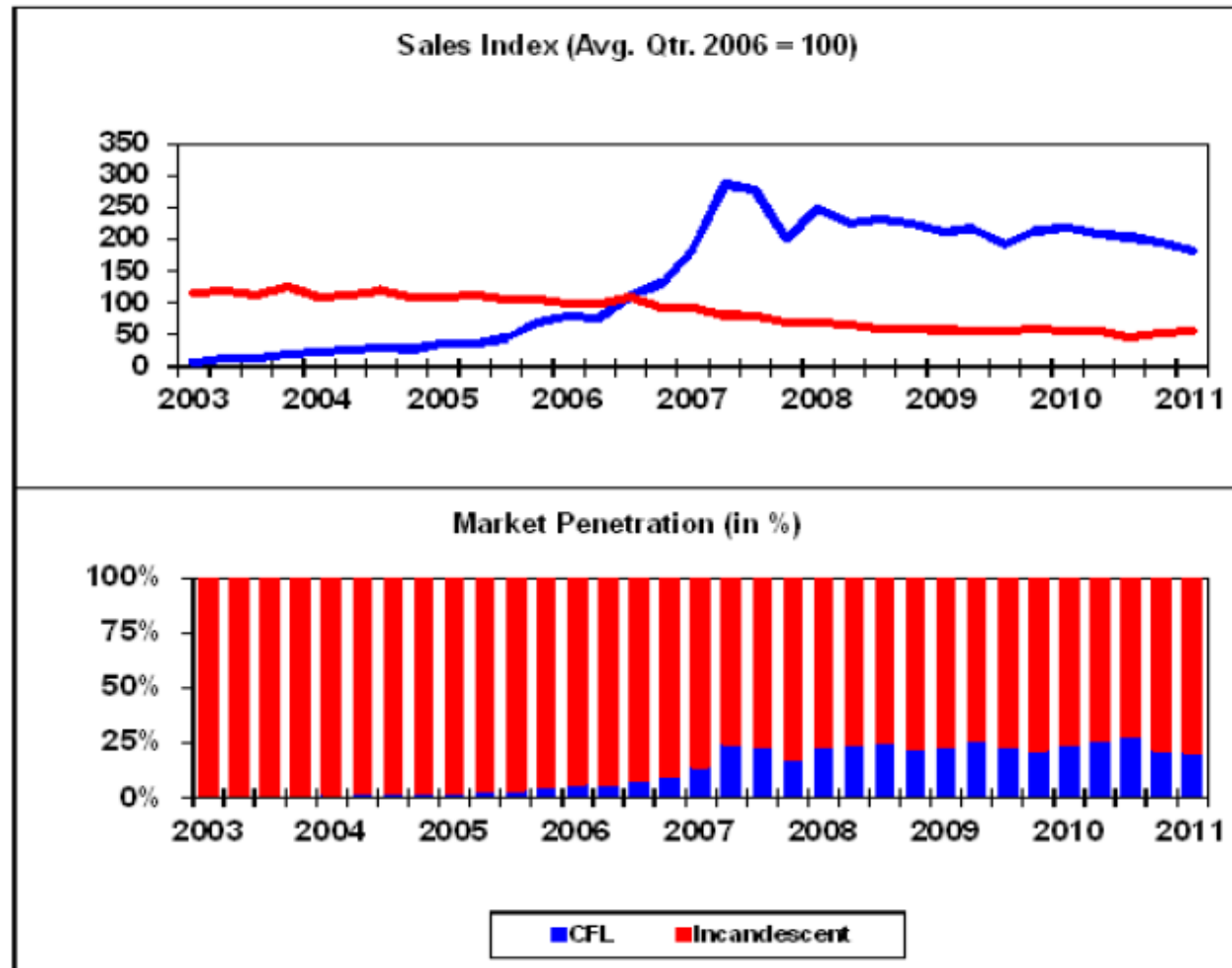
- 1.8 hours --Average daily operating hours
- Average Lamp Distribution in Residences



Incandescent +Halogen	66%
CFL	23%
Linear Fluorescent Tubes	10%
Others	1%

Source: 2010 U.S. Lighting Market Characterization

CFL Market



Source : NEMA

Lamp Manufacturing

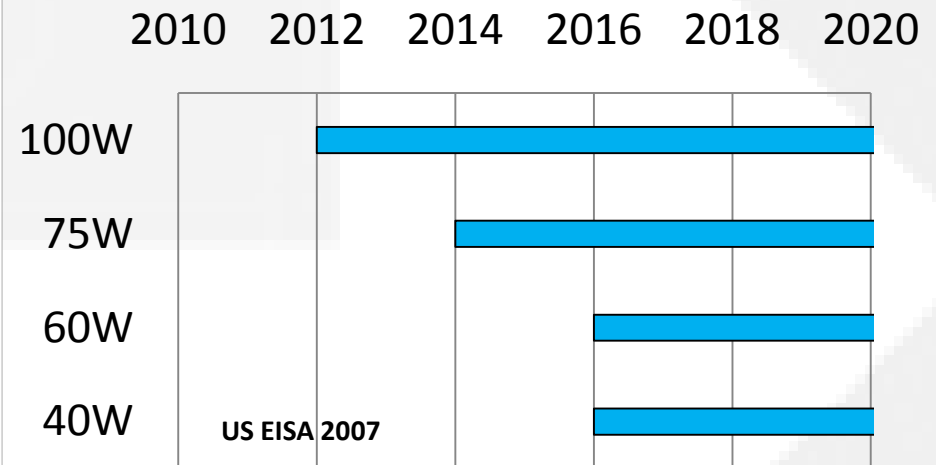
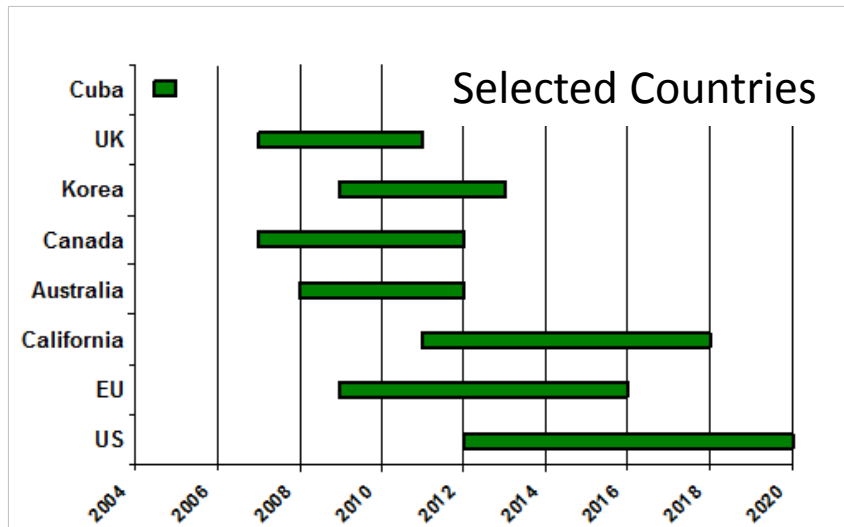
- Mass Commodity Market
 - High volume, low margin
 - Manufacturing scaled to reduce cost
 - China is largest manufacturer with established supply chain
 - India, Bangladesh, Vietnam increasingly participating in manufacturing
 - Some specialty lamp manufacturing scattered in industrialized countries
- Few large players dominate
 - Philips, GE, Osram, Sylvania, Toshiba
- Many medium scale companies with manufacturing in China—TCP, Satco, Feit

LED Replacement Lamps

Outlook 2012-2016

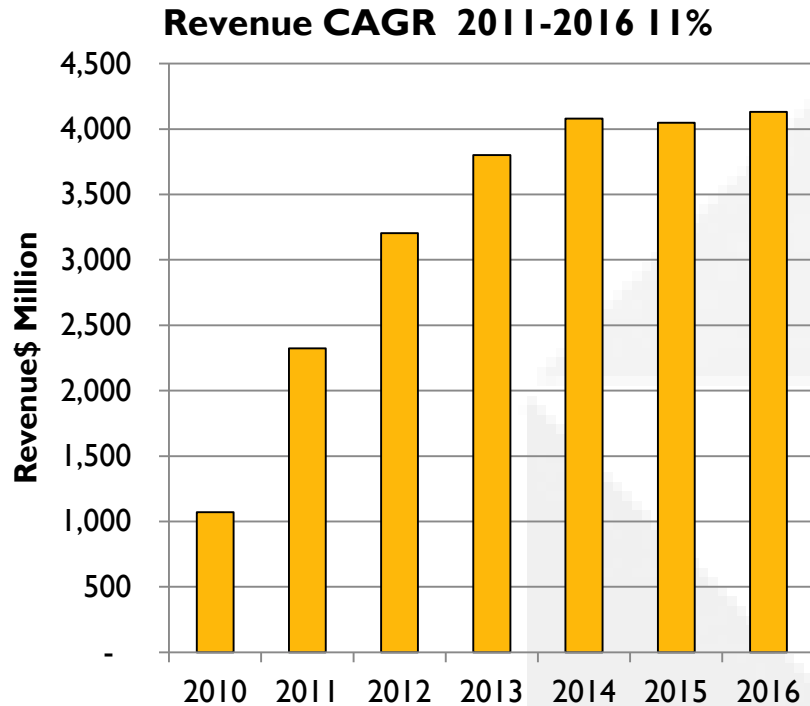
More Changes Expected...

- Incandescence under pressure to improve efficiencies

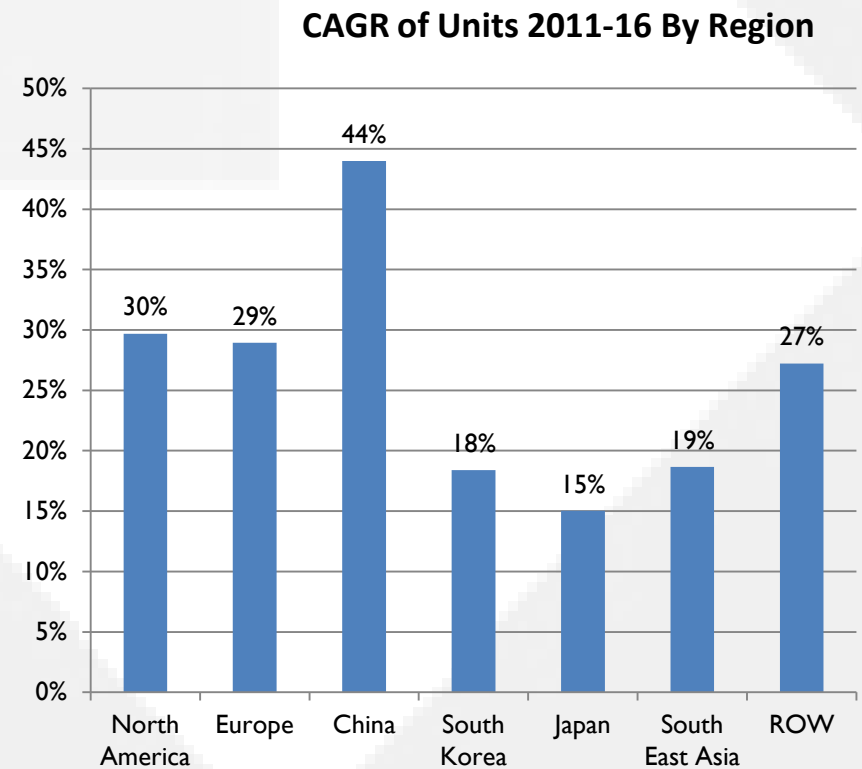


- Prices of fluorescent phosphors are increasing and supply is limited, 2011 saw lamp price increase-10-25%
- High efficiency standards for ballasts for fluorescence as well as metal halide light sources

Outlook 2012-2016



Source: Strategies Unlimited



Source: Strategies Unlimited

China

Largest Market

- The 12th Five Year Plan includes subsidies for LED lighting products- mostly LED replacement tubes and lamps

Factory to the world

- There are over 4000 enterprises
 - mostly small
 - About 13% are only tube manufacturers
 - About 10% manufacture only bulb manufacturers

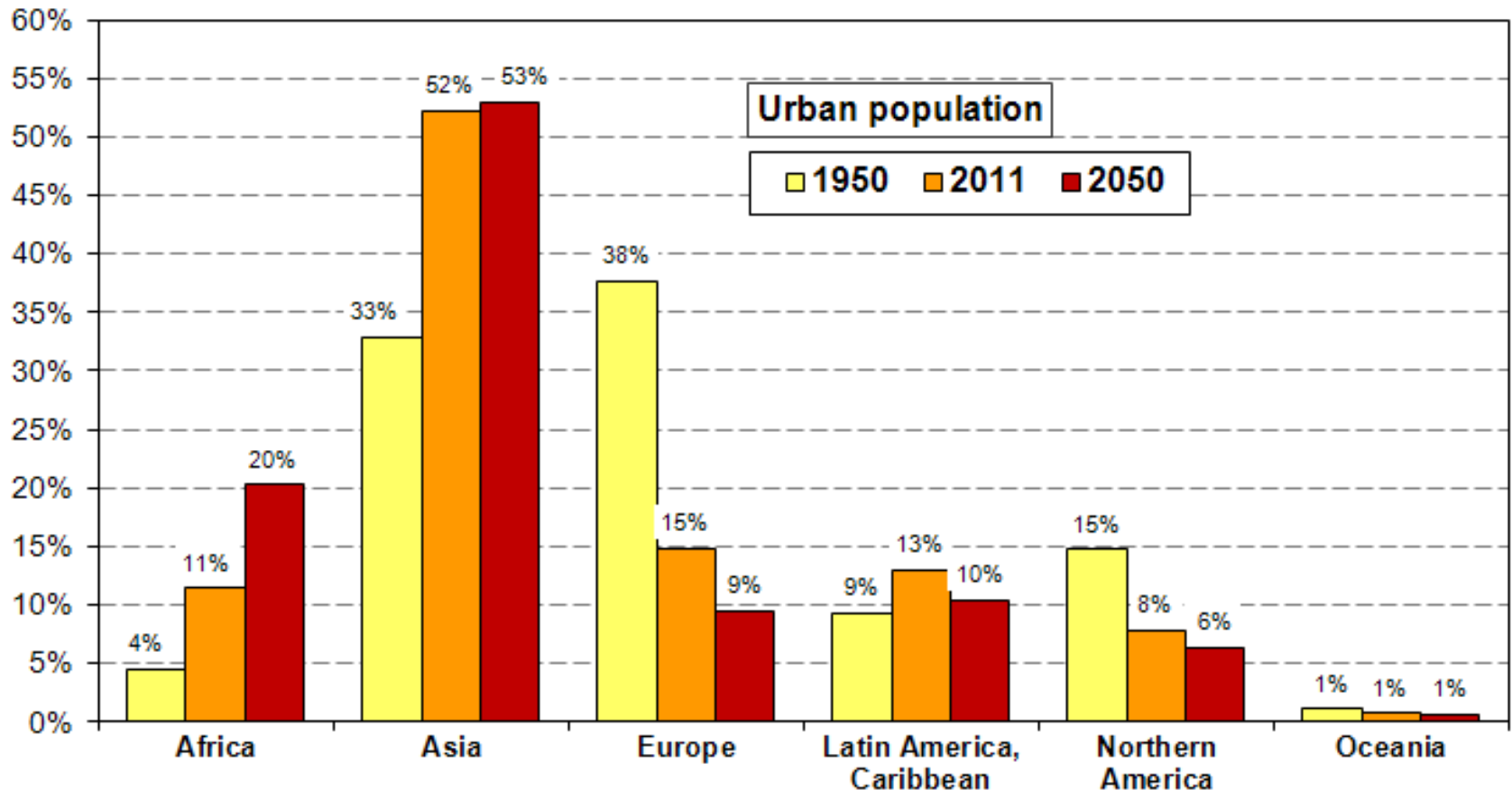
Future Market

Filling Existing Sockets
And new installations..

Where?

Future Demand for Lighting

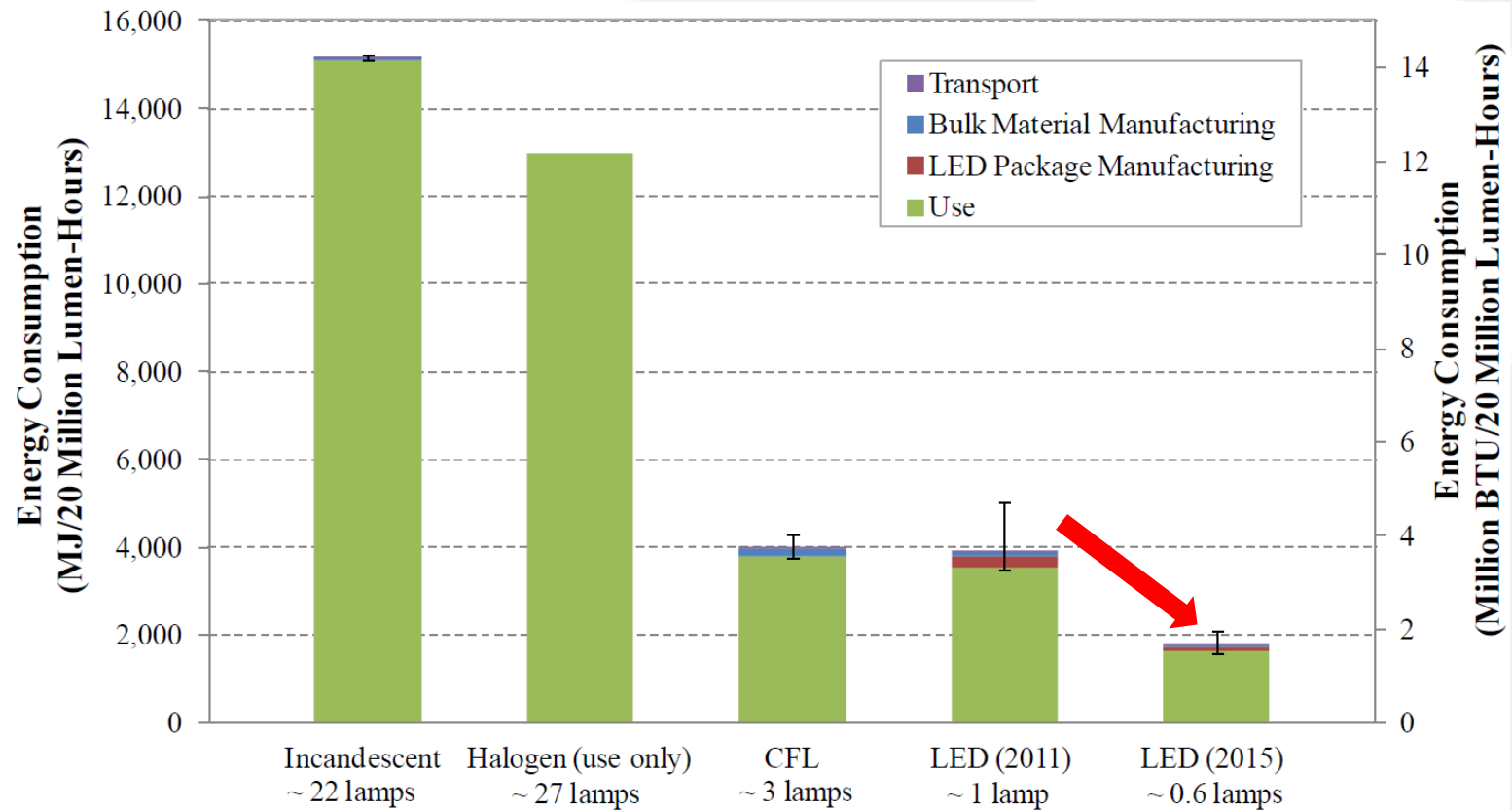
Distribution of the world urban and rural population by major area



Source: United Nations, Department of Economic and Social Affairs, Population Division:
World Urbanization Prospects, the 2011 Revision.
New York, 2012

Why LED Replacement Lamps

Life-Cycle Energy of Incandescent Lamps, CFLs, and LED Lamps (DOE, 2012a)



Future LED lamps

Intelligent Appliance?

Already here:

- Remote controlled bulb--Insteon
- NXP chips giving IP address in each bulb

Thank you

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